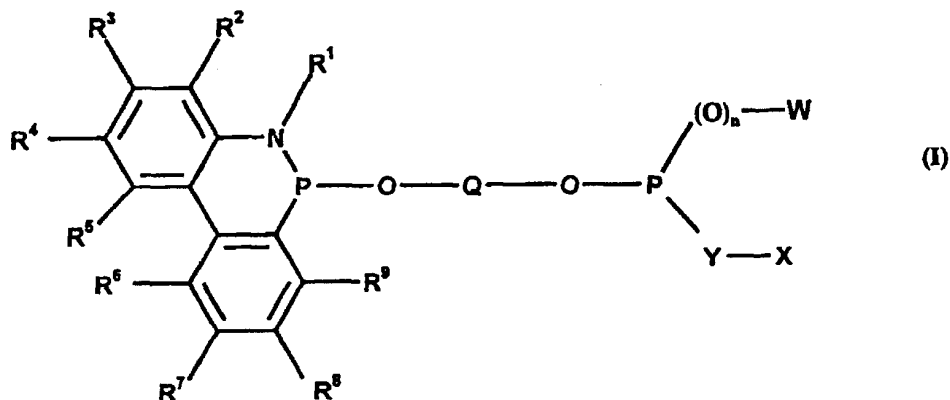


CLAIMS:

1. A phosphinine of the formula I



where

$n = 0$ or 1 ,

$Y = O, NH, NR^1$,

$R^1 = H$, an aliphatic or aromatic hydrocarbon radical having from 1 to 25 carbon atoms,

$R^2, R^3, R^4, R^5, R^6, R^7, R^8, R^9 = H$, an aliphatic, alicyclic, aliphatic-alicyclic, heterocyclic, aliphatic-heterocyclic, aromatic, aromatic-aromatic, aliphatic-aromatic hydrocarbon radical having from 1 to 50 carbon atoms, where R^2 to R^9 are identical or different and may be covalently linked to one another, $F, Cl, Br, I, -CF_3, -OR^{10}, -COR^{10}, -CO_2R^{10}, -CO_2M, -SR^{10}, -SO_2R^{10}, -SOR^{10}, -SO_3R^{10}, -SO_3M, -SO_2NR^{10}R^{11}, NR^{10}R^{11}, N=CR^{10}R^{11}, NH_2$,

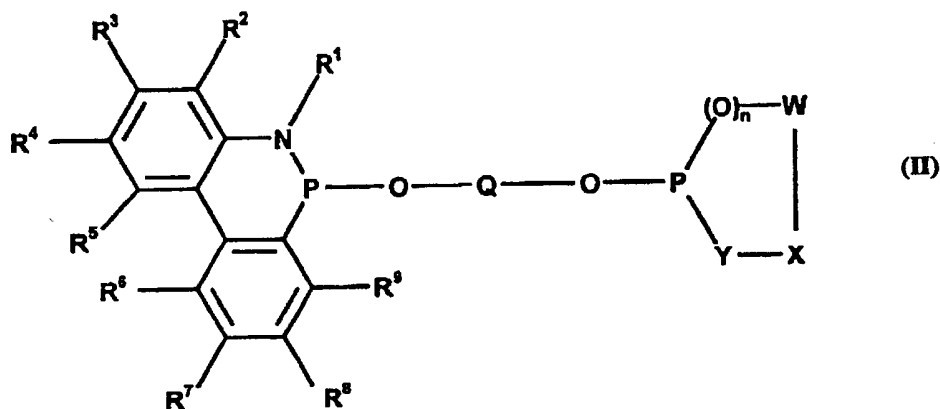
$R^{10}, R^{11} = H$, a substituted or unsubstituted, aliphatic or aromatic hydrocarbon radical having from 1 to 25 carbon atoms, identical or different,

$M =$ an alkali metal, alkaline earth metal, ammonium or phosphonium ion,

$Q =$ a divalent aliphatic, alicyclic, aliphatic-alicyclic, heterocyclic, aliphatic-heterocyclic, aromatic, aromatic-aromatic, aliphatic-aromatic hydrocarbon radical having from 1 to 50 carbon atoms, and

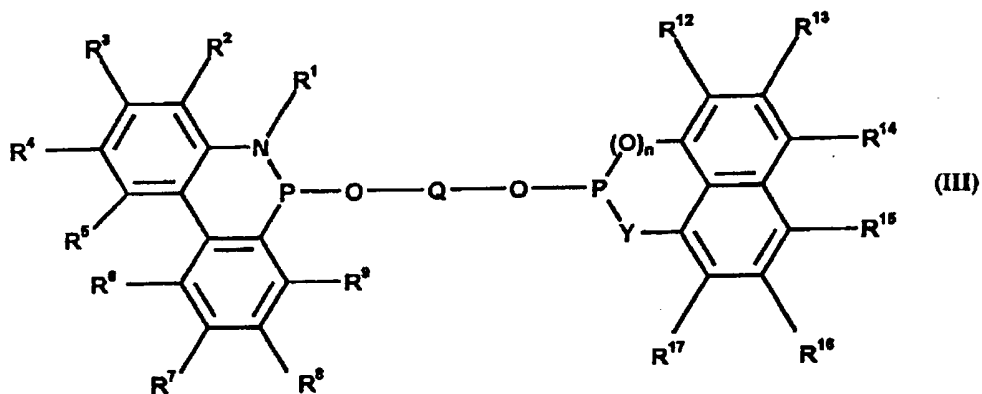
$W, X =$ aliphatic, alicyclic, aliphatic-alicyclic, heterocyclic, aliphatic-heterocyclic, aromatic, aromatic-aromatic, aliphatic-aromatic hydrocarbon radicals having from 1 to 50 carbon atoms, which may be identical or different or covalently linked to one another.

2. The phosphinine as claimed in claim 1, wherein W and X are aliphatic, alicyclic, aliphatic-alicyclic, heterocyclic, aliphatic-heterocyclic, aromatic, or aliphatic-aromatic hydrocarbon radicals having from 1 to 50 carbon atoms and are covalently linked as in formula II



and R¹, R², R³, R⁴, R⁵, R⁶, R⁷, R⁸, R⁹, W, X, Y, n and Q are as defined in claim 1.

3. The phosphinine as claimed in claim 1, wherein W and X are aromatic hydrocarbon radicals having from 1 to 50 carbon atoms and are covalently linked as in formula III



where

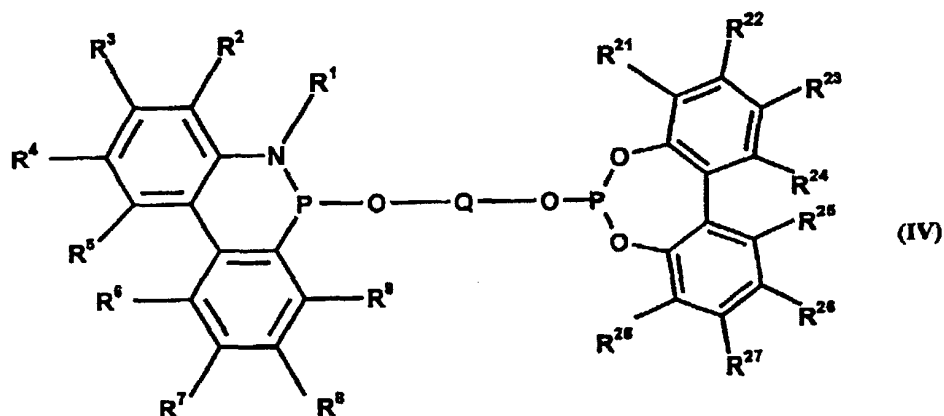
R¹², R¹³, R¹⁴, R¹⁵, R¹⁶, R¹⁷ = H, an aliphatic, alicyclic, aliphatic-alicyclic, heterocyclic, aliphatic-heterocyclic, aromatic, aromatic-aromatic, aliphatic-aromatic hydrocarbon radical having from 1 to 50

carbon atoms, where R^{12} to R^{17} are identical or different and may be covalently linked to one another, F, Cl, Br, I, $-\text{CF}_3$, $-\text{OR}^{18}$, $-\text{COR}^{18}$, $-\text{CO}_2\text{R}^{18}$, $-\text{CO}_2\text{M}$, $-\text{SR}^{18}$, $-\text{SO}_2\text{R}^{18}$, $-\text{SOR}^{18}$, $-\text{SO}_3\text{R}^{18}$, $-\text{SO}_3\text{M}$, $-\text{SO}_2\text{NR}^{18}\text{R}^{19}$, $\text{NR}^{18}\text{R}^{19}$, $\text{N}=\text{CR}^{18}\text{R}^{19}$, NH_2 ,

R^{18} , R^{19} = H, a substituted or unsubstituted, aliphatic or aromatic hydrocarbon radical having from 1 to 25 carbon atoms, identical or different, and

M = an alkali metal, alkaline earth metal, ammonium or phosphonium ion.

4. The phosphinine as claimed in claim 1, wherein W and X are aromatic hydrocarbon radicals having from 1 to 50 carbon atoms and are covalently linked as in formula IV



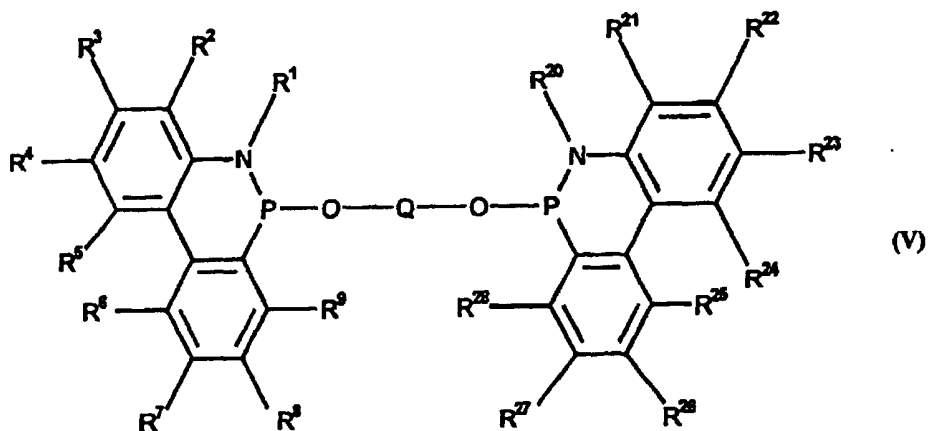
where

R^{21} , R^{22} , R^{23} , R^{24} , R^{25} , R^{26} , R^{27} , R^{28} = H, an aliphatic, alicyclic, aliphatic-alicyclic, heterocyclic, aliphatic-heterocyclic, aromatic, aromatic-aromatic, aliphatic-aromatic hydrocarbon radical having from 1 to 50 carbon atoms, where R^{21} to R^{28} are each identical or different and may be covalently linked to one another, F, Cl, Br, I, $-\text{CF}_3$, $-\text{OR}^{29}$, $-\text{COR}^{29}$, $-\text{CO}_2\text{R}^{29}$, $-\text{CO}_2\text{M}$, $-\text{SR}^{29}$, $-\text{SO}_2\text{R}^{29}$, $-\text{SOR}^{29}$, $-\text{SO}_3\text{R}^{29}$, $-\text{SO}_3\text{M}$, $-\text{SO}_2\text{NR}^{29}\text{R}^{30}$, $\text{NR}^{29}\text{R}^{30}$, $\text{N}=\text{CR}^{29}\text{R}^{30}$, NH_2 ,

R^{29} , R^{30} = H, a substituted or unsubstituted, aliphatic or aromatic hydrocarbon radical having from 1 to 25 carbon atoms, and

M = an alkali metal, alkaline earth metal, ammonium or phosphonium ion.

5. The phosphinine as claimed in claim 1, wherein W and X are aromatic hydrocarbon radicals having from 1 to 50 carbon atoms and are covalently linked as in formula V



where

$R^{20} = H$, an aliphatic or aromatic hydrocarbon radical having from 1 to 25 carbon atoms,

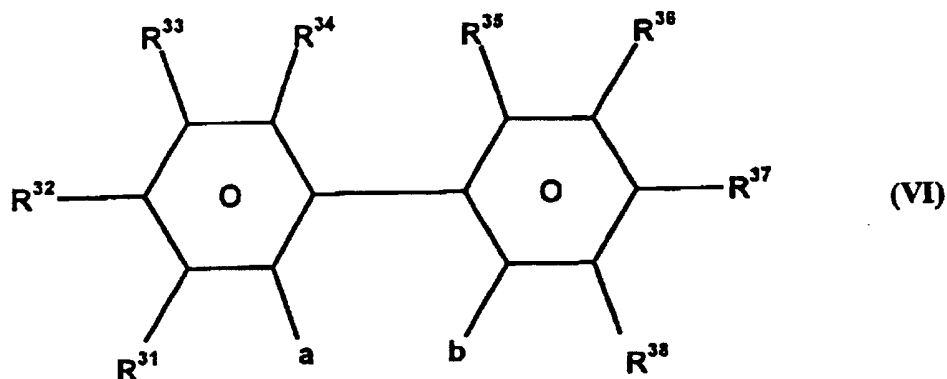
$R^{21}, R^{22}, R^{23}, R^{24}, R^{25}, R^{26}, R^{27}, R^{28} = H$, an aliphatic, alicyclic, aliphatic-alicyclic, heterocyclic, aliphatic-heterocyclic, aromatic, aromatic-aromatic, aliphatic-aromatic hydrocarbon radical having from 1 to 50 carbon atoms, where R^{21} to R^{28} are identical or different and may be covalently linked to one another, F, Cl, Br, I, $-CF_3$, $-OR^{29}$, $-COR^{29}$, $-CO_2R^{29}$, $-CO_2M$, $-SR^{29}$, $-SO_2R^{29}$, $-SOR^{29}$, $-SO_3R^{29}$, $-SO_3M$, $-SO_2NR^{29}R^{30}$, $NR^{29}R^{30}$, $N=CR^{29}R^{30}$, NH_2 ,

$R^{29}, R^{30} = H$, a substituted or unsubstituted, aliphatic or aromatic hydrocarbon radical having from 1 to 25 carbon atoms,

M = an alkali metal, alkaline earth metal, ammonium or phosphonium ion, and

where R^2 to R^9 are identical or different and may be covalently linked to one another.

6. The phosphinine as claimed in claim 1, wherein Q is a hydrocarbon radical of the formula VI



where

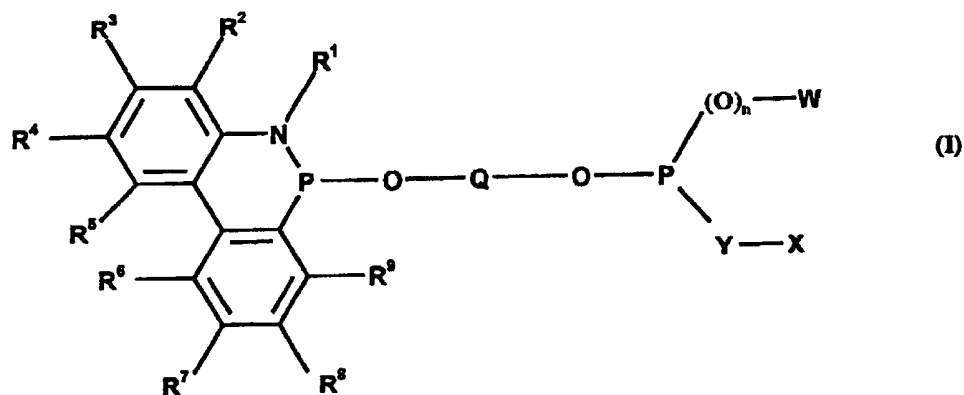
$R^{31}, R^{32}, R^{33}, R^{34}, R^{35}, R^{36}, R^{37}, R^{38} = \text{H, an aliphatic, alicyclic, aliphatic-alicyclic, heterocyclic, aliphatic-heterocyclic, aromatic, aromatic-aromatic, aliphatic-aromatic hydrocarbon radical having from 1 to 50 carbon atoms, F, Cl, Br, I, } -\text{CF}_3, -\text{OR}^{39}, -\text{COR}^{39}, -\text{CO}_2\text{R}^{39}, -\text{CO}_2\text{M, } -\text{SR}^{39}, -\text{SO}_2\text{R}^{39}, -\text{SOR}^{39}, -\text{SO}_3\text{R}^{39}, -\text{SO}_3\text{M, } -\text{SO}_2\text{NR}^{39}\text{R}^{40}, \text{NR}^{39}\text{R}^{40}, \text{N}=\text{CR}^{39}\text{R}^{40}, \text{NH}_2,$

$R^{39}, R^{40} = \text{H, a substituted or unsubstituted, aliphatic or aromatic hydrocarbon radical having from 1 to 25 carbon atoms,}$

$\text{M} = \text{an alkali metal, alkaline earth metal, ammonium or phosphonium ion, and}$

where the positions a and b serve as linkage points.

7. A phosphinine-metal complex comprising a metal of transition group 4, 5, 6, 7 or 8 of the Periodic Table of the Elements and one or more phosphinines of the formula I



where

n = 0 or 1,

Y = O, NH, NR¹,

R¹ = H, an aliphatic or aromatic hydrocarbon radical having from 1 to 25 carbon atoms,

5 R², R³, R⁴, R⁵, R⁶, R⁷, R⁸, R⁹ = H, an aliphatic, alicyclic, aliphatic-alicyclic, heterocyclic, aliphatic-heterocyclic, aromatic, aromatic-aromatic, aliphatic-aromatic hydrocarbon radical having from 1 to 50 carbon atoms, where R² to R⁹ are identical or different and may be covalently linked to one another, F, Cl, Br, I, -CF₃, -OR¹⁰, -COR¹⁰, -CO₂R¹⁰, -CO₂M, -SR¹⁰, -SO₂R¹⁰, -SOR¹⁰, -SO₃R¹⁰, -SO₃M, -SO₂NR¹⁰R¹¹, NR¹⁰R¹¹, N=CR¹⁰R¹¹, NH₂,

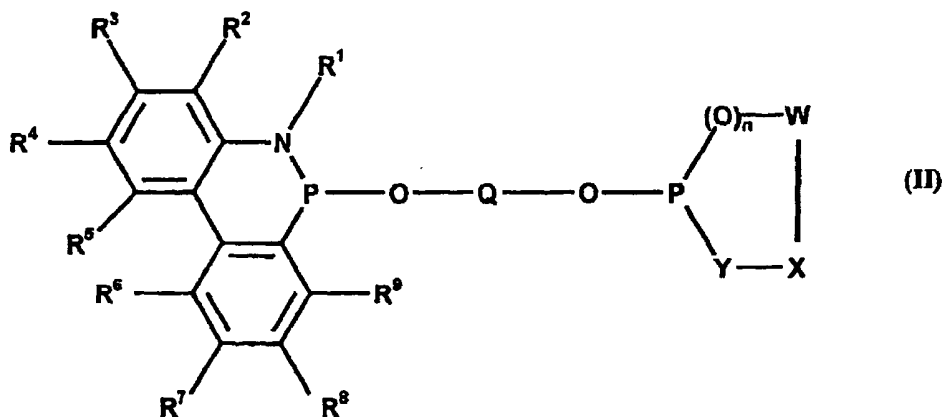
10 R¹⁰, R¹¹ = H, a substituted or unsubstituted, aliphatic or aromatic hydrocarbon radical having from 1 to 25 carbon atoms, identical or different,

15 M = an alkali metal, alkaline earth metal, ammonium or phosphonium ion,

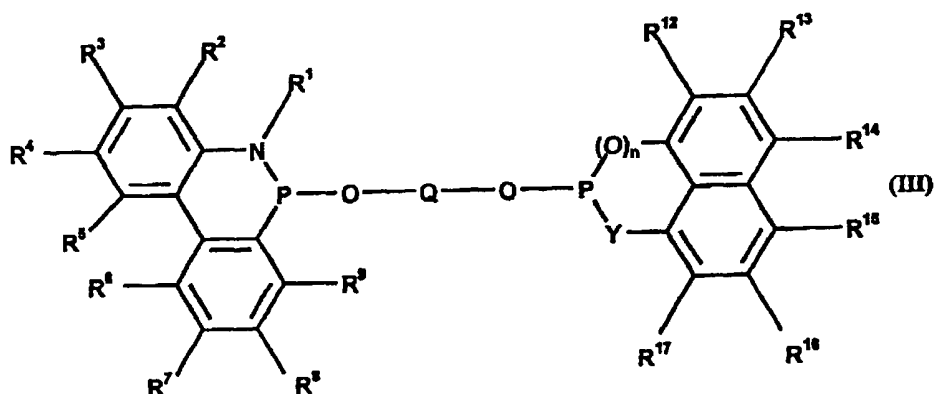
Q = a divalent aliphatic, alicyclic, aliphatic-alicyclic, heterocyclic, aliphatic-heterocyclic, aromatic, aromatic-aromatic, aliphatic-aromatic hydrocarbon radical having from 1 to 50 carbon atoms,

20 W, X = aliphatic, alicyclic, aliphatic-alicyclic, heterocyclic, aliphatic-heterocyclic, aromatic, aromatic-aromatic, aliphatic-aromatic hydrocarbon radicals having from 1 to 50 carbon atoms, which may be identical or different or covalently linked to one another.

25 8. The phosphinine-metal complex as claimed in claim 7, wherein W and X are aliphatic, alicyclic, aliphatic-alicyclic, heterocyclic, aliphatic-heterocyclic, aromatic, aliphatic-aromatic hydrocarbon radicals having from 1 to 50 carbon atoms and are covalently linked as in formula II.



9. The phosphinine-metal complex as claimed in claim 7, wherein W and X are aromatic hydrocarbon radicals having from 1 to 50 carbon atoms and are covalently linked as in formula III



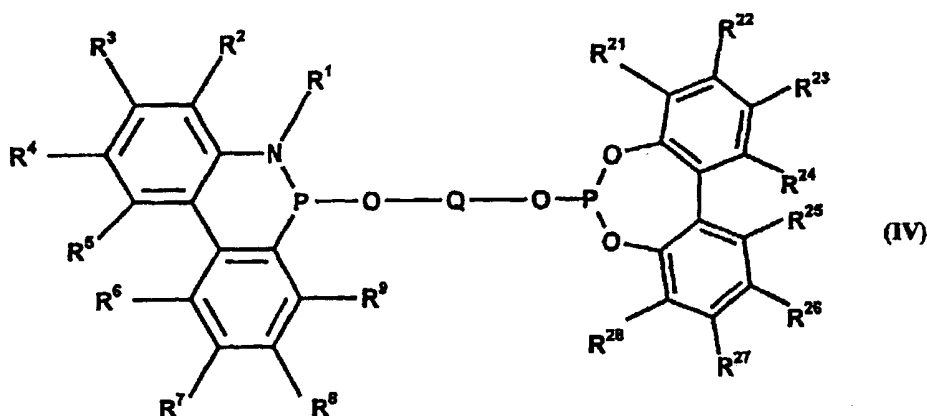
where

$R^{12}, R^{13}, R^{14}, R^{15}, R^{16}, R^{17} = H$, an aliphatic, alicyclic, aliphatic-alicyclic, heterocyclic, aliphatic-heterocyclic, aromatic, aromatic-aromatic, aliphatic-aromatic hydrocarbon radical having from 1 to 50 carbon atoms, where R^{12} to R^{17} are identical or different and may be covalently linked to one another, F, Cl, Br, I, $-CF_3$, $-OR^{18}$, $-COR^{18}$, $-CO_2R^{18}$, $-CO_2M$, $-SR^{18}$, $-SO_2R^{18}$, $-SOR^{18}$, $-SO_3R^{18}$, $-SO_3M$, $-SO_2NR^{18}R^{19}$, $NR^{18}R^{19}$, $N=CR^{18}R^{19}$, NH_2 ,

$R^{18}, R^{19} = H$, a substituted or unsubstituted, aliphatic or aromatic hydrocarbon radical having from 1 to 25 carbon atoms, identical or different, and

M = an alkali metal, alkaline earth metal, ammonium or phosphonium ion.

10. The phosphinine-metal complex as claimed in claim 7, wherein W and X are aromatic hydrocarbon radicals having from 1 to 50 carbon atoms and are covalently linked as in formula IV



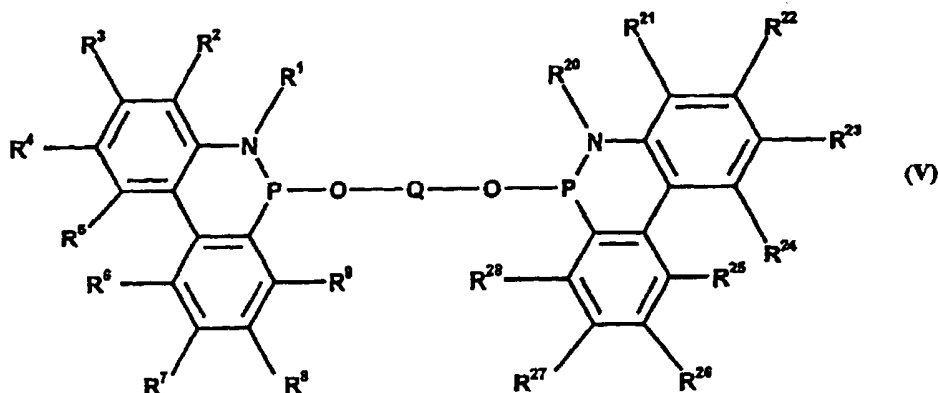
where

$R^{21}, R^{22}, R^{23}, R^{24}, R^{25}, R^{26}, R^{27}, R^{28} = H$, an aliphatic, alicyclic, aliphatic-alicyclic, heterocyclic, aliphatic-heterocyclic, aromatic, aromatic-aromatic, aliphatic-aromatic hydrocarbon radical having from 1 to 50 carbon atoms, where R^{21} to R^{28} are identical or different and may be covalently linked to one another, F, Cl, Br, I, $-CF_3$, $-OR^{29}$, $-COR^{29}$, $-CO_2R^{29}$, $-CO_2M$, $-SR^{29}$, $-SO_2R^{29}$, $-SOR^{29}$, $-SO_3R^{29}$, $-SO_3M$, $-SO_2NR^{29}R^{30}$, $NR^{29}R^{30}$, $N=CR^{29}R^{30}$, NH_2 ,

$R^{29}, R^{30} = H$, a substituted or unsubstituted, aliphatic or aromatic hydrocarbon radical having from 1 to 25 carbon atoms, and

M = an alkali metal, alkaline earth metal, ammonium or phosphonium ion.

11. The phosphinine-metal complex as claimed in claim 7, wherein W and X are aromatic hydrocarbon radicals having from 1 to 50 carbon atoms and are covalently linked as in formula V



where

R^{20} = H, an aliphatic or aromatic hydrocarbon radical having from 1 to 25 carbon atoms,

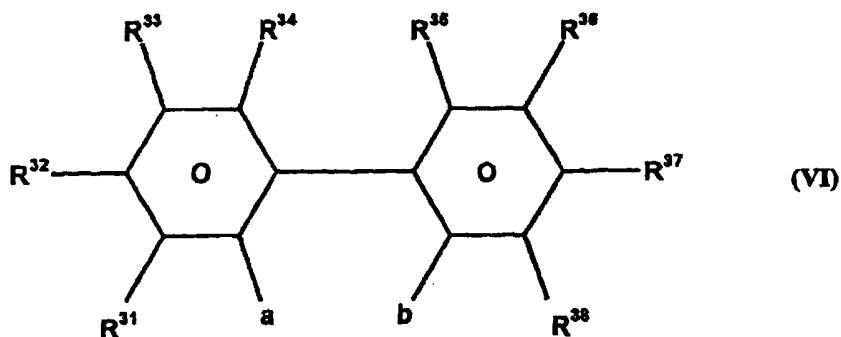
R^{21} , R^{22} , R^{23} , R^{24} , R^{25} , R^{26} , R^{27} , R^{28} = H, an aliphatic, alicyclic, aliphatic-alicyclic, heterocyclic, aliphatic-heterocyclic, aromatic, aromatic-aromatic, aliphatic-aromatic hydrocarbon radical having from 1 to 50 carbon atoms, where R^{21} to R^{28} are identical or different and may be covalently linked to one another, F, Cl, Br, I, $-CF_3$, $-OR^{29}$, $-COR^{29}$, $-CO_2R^{29}$, $-CO_2M$, $-SR^{29}$, $-SO_2R^{29}$, $-SOR^{29}$, $-SO_3R^{29}$, $-SO_3M$, $-SO_2NR^{29}R^{30}$, $NR^{29}R^{30}$, $N=CR^{29}R^{30}$, NH_2 ,

R^{29} , R^{30} = H, a substituted or unsubstituted, aliphatic or aromatic hydrocarbon radical having from 1 to 25 carbon atoms,

M = an alkali metal, alkaline earth metal, ammonium or phosphonium ion, and

R_2 to R_9 are identical or different and may be covalently linked to one another.

12. The phosphinine-metal complex as claimed in claim 7, wherein Q is a hydrocarbon radical of the formula VI



where

$R^{31}, R^{32}, R^{33}, R^{34}, R^{35}, R^{36}, R^{37}, R^{38} = H$, an aliphatic, alicyclic, aliphatic-alicyclic, heterocyclic, aliphatic-heterocyclic, aromatic, aromatic-aromatic, aliphatic-aromatic hydrocarbon radical having from 1 to 50 carbon atoms, F, Cl, Br, I, $-CF_3$, $-OR^{39}$, $-COR^{39}$, $-CO_2R^{39}$, $-CO_2M$, $-SR^{39}$, $-SO_2R^{39}$, $-SOR^{39}$, $-SO_3R^{39}$, $-SO_3M$, $-SO_2NR^{39}R^{40}$, $NR^{39}R^{40}$, $N=CR^{39}R^{40}$, NH_2 ,

$R^{39}, R^{40} = H$, a substituted or unsubstituted, aliphatic or aromatic hydrocarbon radical having from 1 to 25 carbon atoms,

M = an alkali metal, alkaline earth metal, ammonium or phosphonium ion, and

where the positions a and b serve as linkage points.

13. The phosphinine-metal complex as claimed in claim 7, wherein the metal is rhodium, platinum, cobalt or ruthenium.
14. A process comprising hydroformylating an olefin wherein the phosphinine claimed in claim 1 is present in the olefin.
15. A process comprising hydroformylating an olefin wherein the phosphinine-metal complex claimed in claim 7 is used as a catalyst.
16. A process comprising hydroformylating an olefin wherein the phosphinine claimed in claim 1 and at least one other phosphorus containing ligand is present in the olefin.
17. A process comprising hydroformylating an olefin wherein the phosphinine-metal complex claimed in claim 7 is used as a catalyst in the presence of at least one other phosphorus containing ligand.